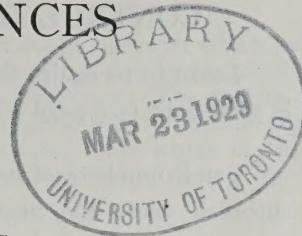


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THE BERTHA ARMYWORM IN THE PRAIRIE PROVINCES



By

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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PAMPHLET NO. 103—NEW SERIES

THE ENTOMOLOGICAL BRANCH

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Published by direction of the Hon. W. R. Motherwell, Minister of Agriculture,
Ottawa, March, 1929

CONTROL OF THE BERTHA ARMYWORM

Learn to recognize the bertha armyworm and watch for its appearance in your field (see page 4 and figures 1 and 2).

Small numbers of caterpillars on the farm one year may forecast an outbreak there the next year. Be prepared to use control measures promptly upon first sign of armyworms.

TO PREVENT OR GREATLY REDUCE LOCAL OUTBREAKS

Thoroughly cultivate the land infested with bertha armyworms in the fall or early spring to destroy the overwintering stage in gardens, weedy patches in fields and on crop areas wherever the bertha armyworms were noted the previous summer (see page 6).

TO CONTROL OUTBREAKS

(1) *When armyworms are feeding openly on field crops garden plants*—dust once with poison, using 1 lb. of poison lime dust (see page 7).

(2) *When armyworms are feeding in gardens by night and hiding by day*—scatter poisoned bran or poisoned weeds thinly around plants attacked (see page 8).

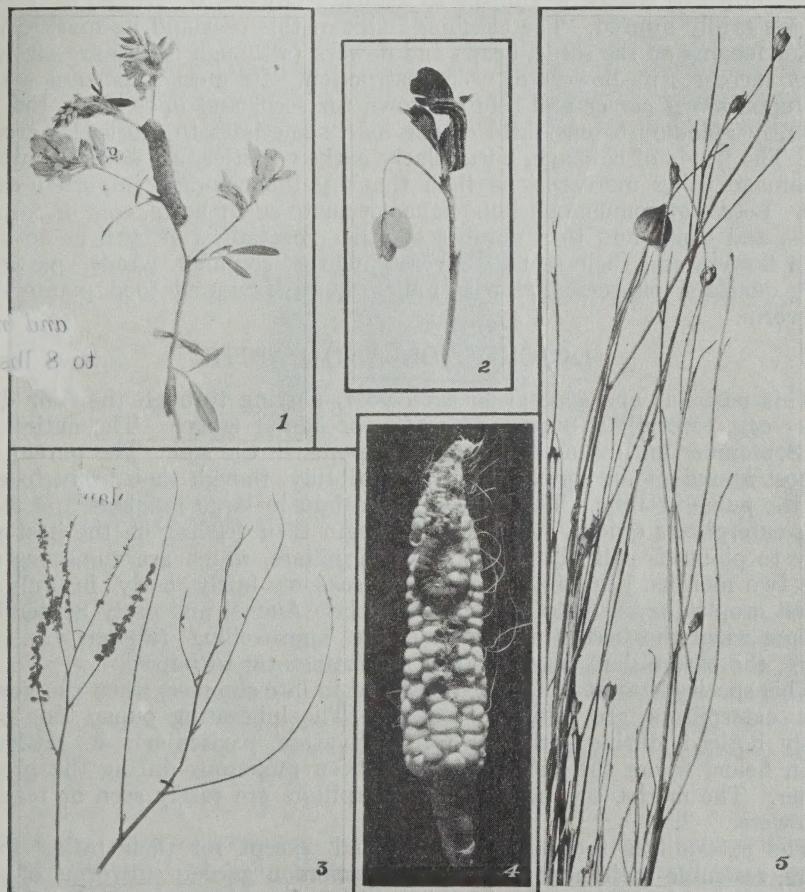
(3) *When armyworms are marching from one field to another*—spread poisoned bran along the border of a furrow ploughed across the line of march (see page 8).

(4) *When growing cabbages*—always dust the plants with calcium arsenate and lime, soon after the plants are set out, and later at weekly or ten-day intervals, until heads are about two-thirds grown (see page 9).

The Bertha Armyworm in the Prairie Provinces

By KENNETH M. KING, Entomologist, Entomological Laboratory,
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The bertha armyworm* is a native insect, a climbing cutworm which, when feeding in large numbers in exposed situations, marches slowly in army-like fashion. It is a pest of very diverse habits and appearance. The species formerly occurred in small numbers feeding on the heads of native prairie plants. Within the past twenty years it has spread to cultivated land, where it attacks a wide variety of broad-leaved plants. The chief injury occurs during the late summer.



Figures 1 and 2, two common colour forms of the bertha armyworm (less than one-half natural size); figure 3, ripe sweet clover, branchlet at right stripped of seed pods by this armyworm, as compared with uninjured twig at left; figure 4, injury to sweet corn; figure 5, mature heads of flax on which this pest has completely consumed all but one of the seed pods (author's illustration).

* *Barathra configurata* Walker.

Each year, since 1921, damage has occurred in some part of Saskatchewan; a rather severe outbreak was present in 1925. The climax, however, came in the widespread outbreak of 1928, which involved the greater part of the prairie area of Manitoba, Saskatchewan, and Alberta,** and extended into the Fernie district of British Columbia. The infestation was particularly intensive in Alberta, where destruction of more than 1,500 acres of sweet clover seed crop was reported.

Judging from its past record, important injury by this pest may be anticipated nearly every year in one district or another; although with great local and annual variations in extent and severity. The recorded ravages have involved the prairie districts and have extended well into the prairie margin of the poplar belt, but not into heavily wooded country.

PLANTS ATTACKED

Virtually every kind of broad-leaved plant of gardens or cultivated fields, whether crops or weeds, is subject to attack. Grasses or grains, on the other hand are rarely injured. The climbing habit of this pest and its marked preference for feeding on the seeds, heads and flowers (although leaves are also eaten) greatly increases its powers of crop destruction. Its most important attack is made upon sweet clover and alfalfa grown for seed, and upon flax; the injury frequently amounts to one-third or one-half, sometimes to the entire crop in a field. The heads of cabbage, particularly early varieties, are severely attacked, the damage being more serious than that by the common imported cabbage worm. Losses of commercial importance occur to sugar beets, ears of corn, pods of peas and beans and to a number of other vegetables, as well as to various garden flowers and their seeds. Several of the common weeds, particularly lamb's quarters, pigweed and wild mustard, are favoured food plants of this armyworm.

DESCRIPTION AND HABITS

This pest has one generation each year, passing through the four distinct stages—egg, caterpillar, pupa, and moth (or adult) stages. The entire period from September until June is passed as a pupa, in the soil. The parent moths are most abundant during the early part of July, though they begin to emerge from the pupæ in June. The eggs are soon laid in large numbers and the tiny young caterpillars quickly hatch out, to begin their feeding on the host plants. Injury to plants is caused only by the caterpillars, which are numerous during about two months, beginning in normal seasons fairly early in July. The greatest crop injury usually takes place in late August and early September, at the time when the bertha armyworms are approaching full growth. When mature, the caterpillars enter the soil and transform to pupæ.

This species is most commonly observed in late summer, when the voracious larger caterpillars are actively feeding. The hibernating pupæ, too, are frequently noticed, during spring or fall cultivation, particularly in gardens but also in fields, where the caterpillars had been numerous during the preceding summer. The moths, eggs and young caterpillars are rarely seen or recognized by growers.

The caterpillars are smooth-bodied and, except for their rather brighter colours, resemble their near relatives, the common garden cutworms of spring. The younger caterpillars are of an inconspicuous pale green shade with three narrow light stripes along the back. When about two-thirds grown, there is a marked change in colour, especially with those feeding in exposed situations, such as when attacking flax, sweet clover and other field crops and weeds. From

** The writer is under great obligation to H. L. Seamans for data and advice in the preparation of this pamphlet.

that time until maturity, the caterpillars are extremely variable in appearance, although two types include the majority. In one of these types the back is brown with conspicuous black markings (figure 1). In the other (figure 2) almost the entire back is black, in four broad bands, separated by three narrow stripes of yellow, while along each side just below the black is a wide yellowish band.

Most of the caterpillars change in appearance at about the same date, normally near the middle of August, giving the very alarming effect of a sudden invasion of hordes of brightly-marked, very hungry armyworms. The change in habits occurring at the same time is almost equally noticeable. Most of the younger caterpillars hide in the soil by day, climbing the plants to feed only at night; they walk with a looping motion, somewhat similar to that of the "measuring-worms". The older caterpillars usually remain on the food plants throughout the twenty-four hours of the day, whether feeding in concealed situations, or, as on flax and similar plants, almost fully exposed to bright, hot sunshine or cold beating rains. When present in large numbers they migrate slowly, chiefly in one direction, suggesting an army, unless they are feeding in concealed locations, such as burrowing in corn ears or cabbage heads. When full grown the caterpillars are the size of an ordinary lead pencil and a little more than one and one-half inches long.



Figure 6.—Pupæ of the bertha armyworm. During spring or fall cultivation this overwintering stage is frequently noticed in gardens or other areas infested the preceding summer (original).

The pupæ occur at a depth of from two to three inches in the ground. They are of a rather dark reddish-brown colour, a little more than five-eighths of an inch long, and taper towards one end (figure 6). They are incapable of motion save for a slight rotary movement of the tapered end of the body. The pair of rather stout, moderately long, straight spines at the tip of the body distinguish this pest from most of the similar pupæ which are found in the ground in the prairies at the same time of year.

The parent moths are of medium size, measuring about one and one-half inches from tip to tip of the expanded wings, which are of dark shades with some markings of olive and whitish. They may be noticed at dusk feeding at flowers, particularly those of wild mustard. They do not fly much around lights, but closely resemble some of the medium-sized "miller" moths, which commonly fly to light. The eggs are laid in flat patches, usually one-half of an inch in diameter, each containing about one hundred eggs; each egg is about the size of a common pinhead. These are placed upon the vegetation later to be attacked by the caterpillar.

NATURE OF THE OUTBREAKS

Usually, the bertha armyworm is present in moderate numbers in a field or locality during the year preceding a severe outbreak there, and sometimes also in the year following it. In few instances have serious outbreaks been recorded in any locality for two years in succession. Occasionally, however, marked damage has occurred in the same field for two or even three or four successive years; such records have been usually in sweet clover fields of several years' standing, which have been allowed to reseed themselves. In gardens, this pest is frequently troublesome for several years in succession. A feature of the outbreaks is the great difference in number of the pest in districts not far distant from each other.

Several natural agencies combine to effect this rather rapid reduction in numbers of the pest following a severe outbreak. The rather high death-rate of the over-wintering pupæ is one of the most important factors which keep this pest in check; there is some evidence that this rate is higher when the soil is dry, and it may also be increased when the snow covering is very light during any part of severe winter weather. The death-rate is greatly increased when the pupæ are disturbed and exposed, as by cultivation. Flocks of crows, feeding on the larger caterpillars, in nearly all outbreaks, have lessened the destructiveness of the bertha armyworm to such crops as flax and sweet clover. In several instances, a considerable part of the crop, which otherwise would have been destroyed, has been saved by the activity of this bird. Diseases affecting the larvæ are also of considerable importance, especially when warm wet weather occurs in late summer. Insect parasites have not been of much value in checking this pest.

CONTROL

At present, recommendations as to methods for control of this pest are somewhat tentative. This results, in part, because of the recent development of this species as an important crop enemy, and in part from the fact that most of the outbreaks have been reported too late to permit fullest results to be secured from the experimental work. Nevertheless, the studies have suggested methods suitable to combat this species under various conditions. Each control measure given has been used in at least one instance by practical growers and found effective.

The methods to be employed vary to some extent with the severity of the outbreak. Success in control depends on the grower becoming familiar with the habits of the species and the appearance of the caterpillars, so that by close observation he may be able to detect the presence of the pest before the damage has proceeded far.

PREVENTION

Cultivation.—A high proportion of the over-wintering stage (the pupæ) can be destroyed by fall or early spring ploughing and cultivation of those fields or portions of fields infested by the bertha armyworm during the preceding summer. It is possible by this means to prevent a local outbreak or, at least, to greatly lessen its severity. Fortunately, as has been said, in the year preceding a heavy outbreak in any locality, the caterpillars are usually present in numbers sufficient to serve as a warning of what will probably occur the following season. These lightly infested patches can then be marked in preparation for ploughing and cultivation at the proper time. In noting such areas, particular care should be taken to include infested patches of lamb's quarters and other weeds, as well as of crops. These weeds undoubtedly serve as important breeding grounds for outbreaks, and in some instances it has been definitely

shown that a moderate infestation solely in the weed patches one year (the field being in grain) has been the direct source for a destructive outbreak involving the entire crop of flax or clover of that or nearby fields in the following season.

Heavy cultivation in the early spring, such as discing or harrowing thoroughly, can be used effectively for the destruction of these pupæ, where ploughing is not feasible, as in perennial stands* of alfalfa or self-reseeded sweet clover. These preventive measures are particularly desirable in fields which, as described above, are especially subject to destructive infestations in successive years.

Fall (or early spring) ploughing and cultivation is especially advisable in gardens, whenever appreciable damage by this species is observed.

Clipping Sweet Clover to Avoid Infestation.—When sweet clover is to be grown for seed, the practice of clipping the fields during the early summer give much promise as a simple, practical, and effective means of avoiding heavy infestation and damage by the bertha armyworm, according to preliminary observations made in Manitoba and Alberta during the outbreak of 1928. The most definite observation along this line was made by Norman Criddle in Manitoba. In this instance, the owner clipped half of a large field of sweet clover during the latter part of June, while the other half was left uncut. Both parts were then left to produce a seed crop. On the unclipped part the bertha armyworm hatched in countless numbers and entirely stripped the plants, while the clipped portion, except for an invasion from the unclipped area, was entirely free from the insect.

This practice is already a common one in some districts, designed to prevent the plants from growing too high and coarse. It appears to benefit the seed crop except under the shorter seasonal conditions of northern Saskatchewan. In some instances, it is practical to use the material for a small cutting of hay. A tentative recommendation that sweet clover seed growers, in districts subject to infestation by this pest, try this clipping method on a small scale, appears therefore to be justified by the results already observed and by the simplicity of this promising procedure. Large-scale use is not recommended until the effectiveness of the method is fully established, and more is known of its direct effect on the size and quality of the seed crop.

CONTROL OF OUTBREAKS

Dusting the Plants.—Excellent control can be secured, when the armyworms are feeding openly, by dusting the plants with calcium arsenate, Paris green or lead arsenate. This method is quite practicable even in large fields of flax, sweet clover or alfalfa, that are heavily or moderately infested by the pest. No special machinery is required, but a simple method may be employed that has been used successfully for the treatment of cotton in the southern United States.

Some 15 to 20 lbs. of the poisoned dusting mixture is placed in each of two bags of stout but loosely woven material which will allow a light cloud of dust to shake out when a bag is jolted (ordinary burlap or jute sacks, if rather loosely woven, are very suitable for this purpose). A bag is fastened near each end of a stout but springy pole about six feet in length (a piece of 1-inch by 2-inch material has been found to give both the needed springiness and required strength). The pole is carried on horseback crosswise of the saddle, so that, as the horse is ridden at a walk through the field, each step jolts the bags, constantly sending out a light cloud of dust, which settles on the plants. The sacks should hang low enough to almost brush the tops of the plants.

* This kind of cultivation ordinarily causes no damage to alfalfa and is sometimes considered beneficial to it; there may however, be some injury to sweet clover. With the latter crop, the cultivation should be done early in the spring before the plants are beginning to grow.

By this method a strip about ten feet wide is dusted. Successive trips should be made up and down the field, each time allowing a slight overlap of the dusted strips. A man or boy with one horse can dust from two to two and a half acres per hour in this way. The dusting should not be done when the wind is blowing, but a slight breeze does not interfere with the process; the early morning and late evening are usually the best times for dusting. To reduce to a minimum the damage by this pest, the dusting should be done as early in the outbreak as possible. With large fields and heavy outbreaks, two or more of the dusting outfits can be used together, covering the ground very rapidly.



Figure 7.—Dusting field crops for the control of the bertha armyworm. Each step of the horse jolts a light cloud of poisoned dust mixture from the bags at either end of the pole (original).

The dusting mixture is prepared in the proportions of 1 lb. of calcium arsenate (arsenate of lime), *thoroughly mixed* with 8 lbs. of some very finely sifted dust, such as lime dust (hydrated lime), road dust, or cheap flour. Either Paris green or lead arsenate mixed with lime is also suitable but is more expensive.

The dust is used at the rate of 2 lbs. of the poison or 18 lbs. of the mixture to each acre. The cost is thus very small. Repeated tests under similar conditions have shown that there is no danger to stock when foliage *dusted at this rate* is later used for hay. Dusting at an excessive rate may be a source of danger to hay and is certainly a waste of material.

In dusting it is well to have the nostrils of both horse and rider covered with a damp cloth. A cloth may easily be adjusted around the horse's nose by utilizing one of the frames such as are used against the nose-fly.

Machines, such as the "hand-gun" and "saddle-gun" (also operated by hand but from horseback), may be secured for applying the dust, instead of using the method described above.

Poisoned Bait.—When the caterpillars are marching in armies, particularly between fields, there is evidence that poisoned baits may be used to advantage. Preferably, a deep furrow is ploughed across their path, along the bottom of which the bait is scattered. The armyworms have been observed to feed readily on poisoned bran bait such as that used against cutworms or grasshoppers. This is prepared by thoroughly mixing 1 lb. of Paris green with 50 lbs. of bran and

then adding water until the bait is entirely moist but not sloppy; a little molasses added to the water, before mixing with the bran, is probably of benefit. A bait of freshly pulled lamb's quarters or pigweed, wet with water and then evenly dusted with Paris green at the rate of 1 lb. to every 30 lbs. of the weeds, should prove equally effective. In either case, for this species, the bait should be spread in the morning as the movement of caterpillars is greatest during the day. It should be renewed when it becomes too dry to be attractive.

Caution.—Bags and heaps of poisoned bait should be kept out of reach of stock and children, and empty bags used for bait should be burned when no longer in use.

CONTROL IN GARDENS

Cabbage.—The most serious injury in the garden is to cabbage. It is strongly recommended that all cabbages be treated with the calcium arsenate-lime dust at intervals of a week or ten days, beginning soon after they are set out and continuing until the heads are about two-thirds formed. This should be done as a matter of precaution, whether or not any armyworms are seen. It is essential to start this treatment early, as the well-grown bertha armyworms work too far into the larger cabbage, before beginning feeding, to be controlled effectively. This is the only practical method at present known for the control of this important pest of cabbage. It is equally effective against the other kinds of cabbage worms.*

The bertha armyworm has not been effectively controlled by the pyrethrum dust remedy, which is widely recommended against other types of cabbage worms.

For gardens where cabbage is grown in quantity, it is advisable to purchase one of the inexpensive, hand-power, dusting machines. In a small garden, poisoned dust may be applied either by using a shaker, such as a tin can in one end of which a number of small holes have been punched, or by using a small loose bag which may be jolted or tapped with a stick to send out a cloud of dust over each plant. *There is no danger whatever in this treatment if properly used, since cabbages grow from within.*

Other Garden Plants.—Most of the other garden vegetables and flowers can be protected from severe injury by this pest, either by dusting the plants with one of the poisoned mixtures or by using a poisoned bait around and under the plants. In a few instances, as with corn, there is at present no feasible control except by hand-picking the caterpillars and then destroying them.

MAKE SURE OF DETERMINATION

In the Prairie Provinces there occur a number of insect species which, when numerous, commonly assume the marching habit, and then are popularly termed "armyworms". The fact that it is abundant and conspicuous only during the late summer, at once distinguishes the bertha armyworm from the majority of these other forms. The beet webworm, however, might easily be mistaken for the bertha armyworm, by one not familiar with both, since this webworm is widely distributed and often very abundant on the prairies, attacks some of the same plants, and occurs at much the same time of year. Such confusion might lead to unnecessary labour and expense, since the beet webworm feeds

* Three other kinds of cabbage worms occur on the prairies, all being greenish in colour. The imported cabbage worm, the young of the common white cabbage butterfly, is ordinarily the most numerous. This is a rather sluggish caterpillar, velvety green and slightly rough to the touch, somewhat smaller than the full-grown bertha armyworm. The much smaller, very active, web-spinning caterpillar of the diamond-back moth often occurs in outbreak numbers. The cabbage looper is only occasionally encountered in the Prairie Provinces.

for the most part on lamb's quarters, Russian thistle and other weeds, where its work is actually of benefit. Only occasionally is it really injurious to crops, and this chiefly when gardens happen to be in the path of a marching army. The beet webworm is much smaller than the full-grown bertha armyworm and is readily distinguishable by its general greenish colour, except for narrow black stripes lengthwise of the body and the narrow black rings around many of the rather conspicuous though scattered hairs. It is much more active, too, and the armies march much more rapidly, in a more definite group. Each webworm trails a slight web, and when disturbed while on a plant, often hangs suspended from it by a thread. The true armyworm, which occasionally occurs in numbers in southern Manitoba in summer, bears a close resemblance to some forms of the bertha armyworm, but prefers grasses and grains, which the latter seldom touches. The poisoned bait and poisoned dust control methods described for the bertha armyworm are also the most effective means of combating these other species mentioned.

To make sure of the identity of an insect pest, especially when encountered for the first time, it is advisable to place a few specimens, with some of the food plant, in a small tin box and send it, together with a letter describing the trouble, to the nearest entomologist. The Dominion Entomological Laboratories, dealing with field crop and garden insects of the Prairie Provinces, are situated at Treesbank, Manitoba; Saskatoon, Saskatchewan; and Lethbridge, Alberta; the provincial entomologists may be reached through the Provincial Colleges of Agriculture.

